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**THE EFFECT OF SAVING INCENTIVES:
EMPIRICAL EVIDENCE FROM HUNGARY**

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This paper reflects the views of the authors and
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Summary

In Hungary, like in many other countries, tax incentives were introduced on voluntary pension saving to increase the level of household saving. However, it is uncertain whether these incentives really increase saving as skeptics argue that households only shift their savings from other types of assets to the tax deferred form. Thus voluntary pension saving may crowd out other types of saving and may not represent new saving. A tax incentive is effective only if the voluntary pension savings are at least partly new ones. In my work, I try to identify elements of the tax incentives which might theoretically affect effectiveness of saving incentives.

Empirical research is needed to evaluate the effectiveness of particular tax incentives. No such research has been done in Hungary. An overview of earlier literature from other countries shows that estimation of effectiveness encounters serious endogeneity problems. Different suggestions were made by economists to overcome this problem but all of them relies on questionable assumptions, and thus the scope of conclusions are limited. I estimated the crowding out effect in Hungary using different methodologies: differences in differences estimation and cohort analysis. Although vaguely, the results suggest that tax deferred pension savings do not crowd out other types of saving in Hungary.

1. Introduction

Household saving is an important policy objective in every country. There are two main reasons for this. The macroeconomic argument is that the production sector is financing its investments partly from household savings, consequently saving incentives indirectly promote investment and stimulate growth. Subsequent evidence shows that the correlation between saving and investment is strong in open economies as well, despite the large volume of international capital flows, see for example Feldstein and Horioka (1980).

The microeconomic concern is that individuals often retire with low wealth and even if they get social security pension benefits they suffer a huge fall in income at the time of retirement. The suboptimal old-age saving of individuals can arise from different sources, such as time inconsistency (e.g. hyperbolic discounting), lack of self control, free-riding (present in most social dilemmas), or underdeveloped financial markets.

In most countries there exist policy efforts to encourage savings. They can take many forms, for instance subsidies (tax incentives) or mandated savings. Assets accumulated for particular purposes can be targeted by these policies. The most popular ones are pension, health, education, housing, and life insurances.

However, governments also face costs when introducing tax allowances on saving. Since individuals from the lower part of income distribution do not have the resources to take advantage of the incentives (Jappelli and Pistaferri 2002), such a tax allowance will be mainly used by high income households. This results in the opposite to what is aimed by the progressive tax schedule. In addition, part of the subsidy will inevitably flow to financial institutions such as pension funds, and is also likely to make additional room for abuse. Direct costs occur, too, as the incentive will decrease the revenue side of the budget.

Although household saving is a hot topic in the everyday media and policy in Hungary, there has been little academic research carried out to assess the effectiveness of different possible policies targeting higher saving rate.

Since social security has basically full coverage in Hungary, the vast majority of families receive pension benefits after retirement. However, there is a drop in income at retirement unless the family has additional savings. In addition, since the Hungarian pension system has only a small funded pillar, most of its volume is not part of investment financing, and thus does not stimulate growth.

Figure 1: Aggregate saving in Hungary between 1990 and 2003 (CPI adjusted real savings expressed in 1990 forint)

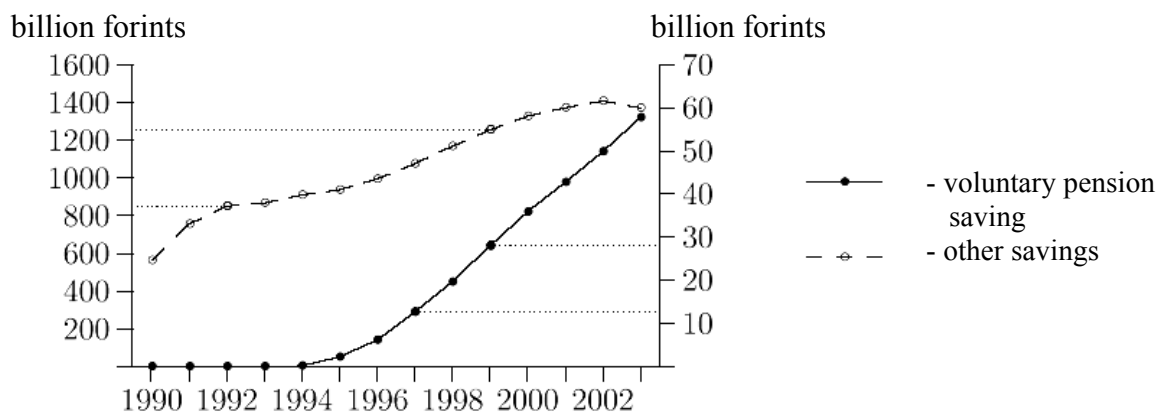


Figure 1 shows the evolution of aggregate assets of the Hungarian household sector¹. Aggregate household saving increased through the 90's. When it first slowed down in the middle of the 90's, tax incentives were introduced in the form of voluntary supplementary pension funds. Then households' finance caught up again, although it is unlikely that pension funds played an important role in that, since the assets in pension funds were only about 1% of total assets. This share is steadily growing but is still only a few percent. In this sense the program is less successful than its counterparts were in the US. One reason for this could be the widespread tax evasion in Hungary. A large part of the highest income families, who would save the most, pay personal income taxes only after a smaller part of their income. Another reason why many people do not take advantage from the tax incentives which constitute the third pillar of the pension system in Hungary is that they trust in the large compulsory first and second pillar of the public pension system. Although the replacement rate calculated for mandatory pensions is not low in international comparison there is still a significant drop in individual income at retirement².

While net financial assets of the household sector have decreased since 2002, the tax deferred pension fund assets still increase. However, increasing pension fund savings do not necessarily increase total savings of households. It is possible that the households contributing to pension funds would have saved the same amount anyway, and they only redistribute other types of savings to the more advantageous, tax favored funds. In this case we say that tax deferred savings *crowd out* other savings. The purpose of my research is to find out whether there is a crowding out effect for the incited pension savings in Hungary. If there were a crowding out effect then not-incited assets would have decreased less in the absence of tax-deferred pension assets. If, however, tax

¹Source: National Bank of Hungary

²Depending on earnings the replacement rate in Hungary is between 70 and 80 percent (source: András Simonovits [2003]), but it can be lower because of unofficial earnings.

deferred savings turned out to represent new savings, then without the tax incentives total assets would have decreased even more than they did according to Figure 1.

This question is important because, as I stated earlier, subsidy has a cost in terms of lost tax revenues. OECD estimates the revenue losses per unit contribution on tax-deferred accounts in OECD countries to be between 0.09 and 0.41 in most countries (Yoo and Serres, 2004). Hungary is in the middle of this picture with 0.28. If the saving in voluntary pension funds does not represent new saving at least in 28% then the program actually decreases national saving. National saving will only increase if households respond to the tax incentive by either decreasing their consumption or increasing their labor supply (e.g. Engen et al. 1996).

Answering this question has relevance for the assessment of recent policy considerations, like introducing another type of tax incentive either instead of the present pension funds or as an option parallel to them. The new incentive on the horizon would probably be more similar to the Individual Retirement Accounts in the United States (see Section 3.2). Savings on capital accounts would be subsidized, and withdrawal before retirement penalized. Unlike pension funds, where the yield is extremely low (sometimes even negative in real terms), savers could choose their own portfolio (Ács and Lovas 2005).

The paper is organized as follows. In the next section, I review economic theories and their prediction about household saving and the effect of saving incentives. In Section 3, I summarize the empirical research about the effectiveness of tax incited voluntary pension saving. In section 4, I describe the peculiarities of the tax incentives in the Hungarian tax system. In Section 5, I present my findings. Finally, Section 6 provides some brief conclusions.

2. Saving and incentives in economic theory

To assess the effect of saving incentives, it is important to understand the way households make their saving decisions and what possibilities the government has to influence the outcome. In this section I will first summarize economic theories about saving of individuals, then analyze the most widespread policies in light of them.

2.1. Saving decisions

Why do individuals save? There are several competing theories on saving behavior. One branch of them is a form or an extension of the so called *life-cycle hypothesis*, while others reject the life-cycle hypothesis and call *behavioral theories* to explain individual saving decisions.

2.1.1. Life-cycle model

According to the life-cycle hypothesis individuals smooth their consumption to maximize expected lifetime utility. To maintain a smooth consumption path independent of the distribution of life-time earning along the life-cycle, individuals have to adjust by saving or borrowing. Typically, a person's earning increases gradually from the time when entering the job market until retirement when it suddenly drops. Life-cycle theory suggests that rational individuals have savings at the time of retirement to offset the sharp drop in income and keep on the smooth consumption path.

The presence of liquidity constraints, when individuals have limited ability to borrow, can alter savings compared to what is predicted by the simple life-cycle model. Liquidity constraints affect savings through two channels. First, when they are present, households will hold some extra savings to insure themselves against unexpected drops in income. This type of saving is called *precautionary saving* in the economic literature³. Second, the life-cycle model predicts, with certain parameters, that people borrow instead of saving at the beginning of the life-cycle. However, savings cannot be negative (or at least not without bounds) if people are liquidity constrained. Thus liquidity constraints not only affect saving by generating precautionary saving but also by lowering the dissaving at the beginning of the life cycle. Honohan (2000) examines the extent to which these channels work. He concludes that precautionary saving is generally low, but the borrowing of the young is much higher without liquidity constraints. He argues that liberalizing financial markets by easing liquidity constraints are partly responsible for the low saving rate in developing countries. The extent to which liquidity constraints are present is thus an important parameter characterizing saving behavior.

A competing explanation for household saving is the so called *bequest motive*, which partly attributes savings to peoples' desire to help their children either by leaving bequest or supporting them at the time when they leave the household. The bequest motive can be incorporated in the life-cycle model either by assuming that individuals gain utility directly from the amount of bequest they leave at the end of their life-cycle or by attaching some weight to the utility of descendants and maximize it together with their own utility.

More complex models also include labor supply, thus saving can increase in a period even when consumption is not decreased, but labor supply is increased instead. Such models differs from the others only in that they treat one particular good, free-time, separately.

According to any model which assumes that individuals are rational, saving can be described as some function of the intertemporal elasticity of substitution, time preference, lifetime income, the distribution of income through time, and the effective interest rate on savings. Intertemporal elasticity

³Precautionary saving can also be derived without assuming liquidity constraints, from risk aversion and uncertainty about future earnings.

is a crucial parameter showing how individuals redistribute consumption in time as a response to an interest rate change. Since the prediction of all theories based on the life-cycle hypothesis depend on its value, much effort was made to determine it, which I will summarize in Section 3.1.

Another important parameter of saving according to life-cycle based theories is the distribution of income through time. It is often measured by the *duration* of earnings defined as

$$\sum_{t=0}^T t \left(\frac{w_t(1+r)^{-t}}{\sum_{s=0}^T w_s(1+r)^{-s}} \right)$$

where w_t is period t wage and r is the effective interest rate. Policies that aim to increase saving have two alternative, either to affect directly the saving by mandating it, or to change the effective interest rate by taxing or subsidizing saving. In case of the latter, in practice, positive elasticity is assumed, thus saving is subsidized. However, the sign of elasticity is theoretically ambiguous and, as we will see later, empirical papers often point out that it is close to zero. If the elasticity were zero, altering the interest rate would have no effect on saving at all.

Figure 2: Two period intertemporal choice

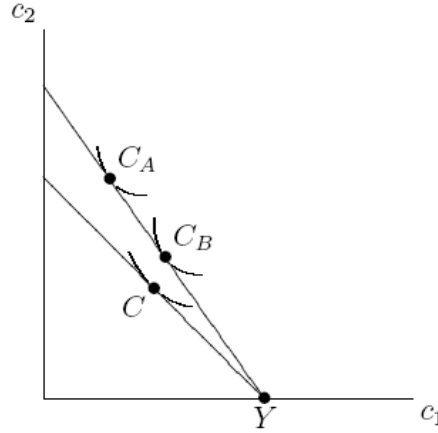


Figure 2 depicts the simplest two-period case, when the person is earning income Y in the first period and no income in the second. An increase in the interest rate rotates the budget line around Y . Its effect on consumption can be separated to *substitution effect* and *income effect*. The first arises from the change in the relative price of first and second period consumption, which appears as a change of the slope of budget line, and tends to increase second period consumption and decrease first period consumption. If consumption is a normal good, which can be assumed, then the income effect tends to increase consumption in both periods by shifting the budget line outwards. As a result, second period consumption will definitely increase but the effect on the first period consumption and thus on saving is ambiguous. On Figure 2 C_A is the

outcome corresponding to a case when the substitution effect dominates the income effect resulting in higher saving. But C_B is a possible outcome, as well, when the income effect dominates the substitution effect leading to lower saving in the first period.

It is worth noting that although an increase in the second period consumption means that saving is higher after the income from interest, but we have to consider $Y - c_1$, the amount of saving before interest, if we seek to determine national saving. When consumption in both periods increases in response to a tax subsidy on savings, the aggregate national saving would increase more by government saving than by subsidizing household saving.

In the general life-cycle model, there are more than only two periods and income may be positive in every period. Then individuals maximize

$$\sum_{t=0}^T u_t(c_t)(1 + \rho)^{-t}$$

with the budget constraint

$$\sum_{t=0}^T c_t(1 + r)^{-t} = \sum_{t=0}^T w_t(1 + r)^{-t}$$

Instead of solving the model analytically I restrict myself to summarizing its main conclusions. Higher intertemporal elasticity of substitution causes a higher elasticity of saving, because in this case an increase in interest rate leads to a larger increase in the ratio of time $t+1$ to time t consumption. The interest rate is the most important tool for the government to influence saving, and the interest elasticity of saving is crucial for the outcome of any policy using it.

Another result of the life-cycle model is that higher duration leads to higher elasticity, other things being unchanged. Particularly, when the household earns income in the first period only then unit intertemporal elasticity of substitution implies that the interest rate has no effect on saving, for smaller intertemporal elasticities the elasticity of saving is negative, and for bigger it is positive. If however the individual has earning in later periods as well, then the elasticity of saving is positive even when the elasticity of substitution is one. On the margin, if duration is sufficiently high, saving elasticity is positive even with inelastic intertemporal substitution, for example with Leontief preferences (Bernheim 2002).

If higher duration increases the interest elasticity of savings then the elasticity is higher in a country with a pay-as-you-go social security system, than in one without it. Since the pay-as-you-go pension system is unfunded, pension benefits do not depend on interest rate, which is a crucial assumption, otherwise present discounted value of earnings does not fall in response to an increase in the interest rate. Even a funded compulsory system can increase the elasticity of additional saving to the effective interest rate of additional savings in the case when the interest on compulsory saving is fixed and the elasticity is calculated with respect to the change in the interest on voluntary saving. This condition

usually holds when we examine the effects of one policy, because one type of tax incentive addresses usually one type of saving only, but in most countries different tools are used at the same time and we have to be aware of the possible interaction between them.

2.1.2. Behavioral theories

Another branch of literature (for a literature review see Bernheim, 2002) points out that perhaps other forces than intertemporal optimization drive the individual decisions. Behavioral theorists say that most people do not solve the utility maximization problem described by the life-cycle theory. They argue that it is hard to believe that people can solve such a complex optimization problem, and since life cycle saving decision is not a repeated task they do not even have the possibility to learn the optimum from experience (Thaler, 1994).

Low household saving is often explained by *time-inconsistency*. This theory suggests that people save below the optimal level because in the present they undervalue their future utility. If this were the case mandating saving by governments could restore efficiency (assuming that government knows what would be the optimal level, which is questionable). A closely related explanation is that people *lack willpower*, saying that people know that they should save more but do not act accordingly. If this were true then restrictions, such as penalties on money withdrawal or mandatory contribution, would help people to overcome their own myopic behavior. Perhaps these features of voluntary saving plans are more important than the tax allowance.

Another behavioral explanation is based on the possibility that people have difficulties in making saving and investment decisions because of the complexity of the problem. Their behavior is assumed to be governed by incomplete information. The introduction of saving incentives may simply increase the awareness of people about the importance of saving, and can increase saving through this mechanism. An important observation by Madrian and Shea (2001) is that by making complex decisions, people might have a tendency towards what is called “anchoring around the default”. This means that when a default option is available, people are likely to choose that. The default option can be offered by the pension fund or by the employer or it can simply be what most people do. For example, if it is advantageous for an employer to pay part of the compensation in pension fund payments and do so, then employees happily accept it even if they would not save otherwise. Another connecting phenomena, the “peer effect”, is examined by Duflo and Saez (2000). They find evidence that peers’ saving decision influences individuals’ own decisions.

Bernheim (2002) highlights the importance of third-party activities. According to him, promotion activity of investment institutions strongly alters individual behavior. It might be reasonable then to incite these institutions instead of, or in addition to, the individuals who make the decision.

People may be more willing to pay to a saving account than to tax authorities. This motivates the observed behavior that many people turning out to have tax dues at the end of the tax year contribute a larger amount to saving accounts instead of paying the taxes to the authority.

Thaler (1994) introduces the term “mental accounts” to refer to the fact that people have different propensities to save on one part of their wealth and lower on another, depending on where the wealth comes from, and in what form it is. Based on this he suggests making an option for tax payers to receive their tax refund on their saving account.

Framing effect is an expression used for the fact that individuals’ decision is affected by the framing of the question. For example it might matter whether people think of the intertemporal choice question as how much to consume in a particular time period, or as how much to save. Saving policies might change how individuals phrase the questions for themselves. And also, the same policy can be more effective with the proper framing

Whatever forces motivate household saving, government intervention to increase saving is justified on at least two grounds. First, the externalities arising from the social benefit of higher aggregate national saving results in below optimal individual saving. Second, some individuals might fail to optimize their own consumption path because of time inconsistency, lack of self control or the complexity of saving decisions. This second failure leads to suboptimal savings as well. In the next section I will overview policy tools for increasing household saving.

2.2. Saving incentives

To incite household saving through the tax system, one possibility would be a shift from income to consumption tax. The main drawback of this approach is the immediate redistribution from the old to the young, and from those who have savings to those who have debt. For example, those who have savings have already payed higher income tax on their savings and will pay higher consumption tax when they consume it. This alternative is not used in practice, perhaps for this reason.

Mandatory saving can both increase national saving and overcome the myopic undersaving problem of families. The effectiveness of mandatory savings, similarly to voluntary savings, crucially depends on the extent of crowding out effect. If mandatory savings crowd out other types of savings then it is ineffective in the sense that they do not increase overall savings. According to Pistaferri (2002) mandatory pension saving does not fully crowd out personal saving. First, pension wealth is illiquid and people are liquidity constrained. Second, pension wealth is more uncertain than private wealth, and uncertainty leads to lower consumption in general. Third, people might retire earlier if the pension wealth is higher, and need more private saving because of the longer

retirement period. Although two of these arguments, the first and the third, are valid to subsidized voluntary saving as well, there is much more debate about the effectiveness of subsidies than of mandating.

Subsidizing voluntary saving is the most widespread tool in developed countries. Subsidy is usually implemented in the form of tax allowance, which can be either on the principal or on the interest (or possibly on both of them). Careful implementation is necessary to avoid abuse by short term investing in subsidized assets and financing investment from borrowing on a lower interest rate. The threat of abuse is smaller if agents are liquidity constrained. Usually low income families face more liquidity constraints, which points to a potential weakness of this policy, because the bulk of saving is coming from high income families. To overcome the above problems, such programs subsidize only long term pension saving, brought into effect by penalties on early withdrawal.

In practice, the subsidy on payments to incited saving accounts is subtracted from personal income tax. It can be subtracted at the time of contribution, when the money is saved, or at the time of withdrawal, when benefits are received. According to the timing of the subsidy, saving plans are called front-loaded (subsidy received at the beginning of saving period) or back-loaded (subsidy received at the end of saving period). As noted by Engen et al. (1994) a front-loaded plan, with the same tax credit, is usually more advantageous for the taxpayer because working age tax rates are typically higher than retirement age rates. In addition, knowing that some individuals might have time inconsistent preferences, front-loaded plans can be more effective, since in case of a front-loaded plan the household gets the subsidy when it makes the decision on saving, and not several years later as in case of a back-loaded plan.

Tax incentives usually subsidize long term saving. In exchange for the subsidy these assets are less liquid than other types of savings. In practice, a penalty has to be paid if money is withdrawn before retirement, or before some years of accumulation in case of pension saving, or if the accumulated assets are not used for housing in case of home ownership saving plans.

The whole population is not necessarily eligible for tax-deferred saving. When the main reason to start such a program is that some individuals save below their needs because they lack self control, then it might be reasonable to somehow include only this group into the program. It was the case in the US when Individual Retirement Accounts (IRAs) could only be opened by those who did not have other pension coverage. Another reasonable restriction may be to exclude high income household above a certain threshold, in order to avoid redistribution towards the richest families. In addition, as explained in the previous section, the contribution of families who can borrow without limits does not increase total saving because they can finance payments to the plan from debt. As high income families can borrow more easily their exclusion might increase the effectiveness of the program. High income individuals are not eligible for IRA in the US since 1986. Eligibility could be also tied to age to avoid that people close to retirement age, who can access the tax-deferred

savings without penalty soon, fund contributions from liquid types of savings or from short term debt. Eventually, in Hungary, just the opposite is in force: older people can contribute more to tax deferred saving funds.

Another important parameter of saving plans, which has to be chosen with discretion, is the upper limit of subsidy. If the upper limit is too high then the revenue loss for the government will be high, and in addition it induces distribution towards the high income families. On the other hand, when the upper limit is too low, the marginal interest rate is increased only for a few people, for those who save less than the limit. For the others, the subsidy is simply a transfer, and does not increase saving. Thus choosing too low limit might lead to an ineffective program. On the other hand, limits have an importance emphasized by Bernheim (2002). According to him, as agents have bounded ability to make optimal decisions, the contribution limit may define targets for saving.

When the concern is the microeconomic point of view, i.e. that individuals undersave for their pension age because they lack self control, inciting non-financial saving can be reasonable. In practice, many forms of intervention are used, such as direct subsidy, tax incentive on saving for home purchase or on mortgage debt payments. National saving is negatively correlated with the loan value ratio of available mortgages (Honohan, 2000). Invigorating mortgage market for purchasing homes increases the living condition of families but increases the level of national saving only if individuals want to save more for the down-payment.

To sum up, there are many possibilities for government intervention to stimulate household saving. It is not obvious, which is the best to use, or how to mix them. In addition, even if a government chose for instance to introduce tax incentives on long term saving, it could be done in many different forms. The extent and timing of the subsidy, the eligibility, the upper limit, penalties, or the form of saving which is subsidized all matter, and the outcome of the program could be sensitive to them. The way households make saving decisions is difficult, and competing theories explain it in different ways. How households respond to a saving incentive is even more complex, and different theories have different predictions already in the most simplified cases. Thus empirical analysis of the saving incentives is necessary. In the next sections I will concentrate on tax incentives on voluntary savings, and analyze their effect on household saving and on national saving.

3. Experience from other countries

In other countries, especially in the United States, much research has been done about the crowding out effect of tax incentives on voluntary savings. Although not completely the same, the incentives in other countries are similar to the incentives in Hungary, and thus some inference can be drawn from this body of research with respect to Hungary as well. Importantly, too, earlier literature provides a wide variety of empirical methods which can be used to analyze household saving. In this section I review the empirical literature, highlighting both the methodologies dealing with the difficulty of identifying the effect of incentives and the main conclusions.

3.1. Intertemporal elasticity of substitution

The intertemporal elasticity of substitution shows how much the consumption, and thus the saving, changes in response to a change in the interest rate. With regard to the effectiveness of saving incentives its value is crucial, because saving incentives actually influence the interest received on savings. If interest elasticity were negative then households would react to an increase of the interest rate by reducing savings, if it were around zero then it would have no effect on savings and if it were positive then higher interest rates would incite saving. Its value around unity would imply that that the ratio of consumption to the consumption in the previous period is proportional to the interest rate.

A branch of empirical studies estimates interest elasticity of saving by simply regressing consumption or saving on the effective interest rate as one of the explanatory variables. Estimates are in a wide range, between 0 and 0.4 (Bernheim, 2002). Two often cited papers on the extreme are Boskin (1978) and Hall (1988) (see also Feldstein, 1995). Boskin estimates the intertemporal elasticity of consumption to be around 0.5 which, according to him, is large enough to make room for policies raising the after tax rate of return on capital. Hall estimates the elasticity using many different datasets for the expected interest rate, and concludes that the elasticity is around zero and probably not above 0.2.

One of the most important parameters deciding how effective the saving incentives can be is thus not only theoretically uncertain but also empirical results are mixed. The issue becomes even more difficult when the effect of a tax incentive is to be estimated. Tax incentives which subsidize long term voluntary savings change the effective interest rate (i.e. the interest rate what is perceived together with the subsidy) but usually not with a fixed primarily determined amount. The effective interest rate after taxes can be different for different assets and different people. Interest rate may not be fixed even for the same person and the same asset because there are limits above which the contribution does

not enjoy the tax allowance. Framing and timing effects change individuals' decisions through channels explained by behavioral theories. Although elasticity of saving is an important parameter, a high elasticity would not assure that saving incentives are effective and incentives can be effective even if the elasticity is around zero. The complexity of saving incentives and the contradicting theories explaining how and why they would be beneficial make necessary to carry out research directly about these saving programs.

3.2. Crowding out effect of tax deferred savings

Next, I overview empirical research trying to estimate the extent to which contributions to tax-deferred saving accounts increase household saving or crowd out other types of household saving. The empirical literature is large in the United States and mostly consists of a still unresolved debate between economists who believe that tax incentives have a large positive effect on savings and those who believe that it has no or very small effect only. In this subsection I cover the literature on incentives in the US, and I devote a separate subsection to papers using data from other countries.

In the United States there are two types of tax-deferred saving accounts introduced in the 70's hoping to increase household savings: Individual Retirement Accounts (IRAs) and 401(k)s. Both are front loaded accounts with tax free accumulation. (For a detailed description of these plans see e.g. Engen et al., 1994.) Neither IRA nor 401(k) saving is available for the full population. IRA's were first introduced for workers without pension coverage, then eligibility extended to all workers, and later eligibility was revoked from families with pension and income above a certain threshold. The eligibility for 401(k) accounts is decided at the level of the employer. One way of identifying the effect of tax-deferred saving plans is to observe the effect of changes in IRA rules. Another way is to exploit the cross-sectional differences in 401(k) eligibility. Unfortunately, the variation in eligibility is not fully exogenous. In case of IRA it depends on whether the individual has pension coverage or later on income. In case of 401(k) the exogeneity, as it depends on where the individual is working, is more believable, but still can be correlated with unobserved saving characteristics. Contributions to both IRAs and 401(k)s are tax-deductible only below certain limit. This limit was also subject to changes several times, in addition the employer can also define additional limits for 401(k) contributions as a percentage of the salary. The variation of limits are also often used by empirical studies, because these are presumably exogenous changes.

In one way or another, all the empirical studies compare savings of those who have IRA or 401(k) account with those who do not have, or examine the correlation between tax-deferred and other savings. The difficulty arises from the fact that the variation in the amount saved on tax deferred accounts is not

exogenous. Families who have higher propensity to save, save more in IRAs and 401(k) and also save more in other forms. Unfortunately the propensity of individuals to save cannot be observed. Not even panel data are helpful because the variation of the IRA contribution for the same person in time is either explained by observed variables (e.g. income) or is most likely to be due to a taste change which also affects other savings. The effort to identify which part of saving is due to individual differences and which part can be attributed to the tax incentives itself has led to a wide variety of techniques. In every case, the methodology is validated by at least one crucial assumption which is later debated by other authors. I shortly summarize the methodologies and results of a few interesting studies from both sides of this debate. For a more exhaustive review of this empirical literature see Bernheim (2002).

One way to control for heterogeneity of tastes is to find measured variables which are expected to explain the variation in tastes. The most important variable is income, but it is usual to control for age, family size and other parameters as well. After removing at least a part of the individual taste effect by controlling for these variables, one can check if there is still some positive correlation between IRA or 401(k) savings and other savings. Poterba et al. (1995, p. 17-23) use this methodology. They control for age, income, education, marital status, the eligibility for 401(k), and whether the family has 401(k) saving or IRA saving. Their results show that while IRA and 401(k) savings were growing through time, the other savings of families did not decrease, and they conclude that the increase of household savings between 1984-1991 was almost entirely the effect of tax incentives. The crucial assumption in order to really overcome the endogeneity problem outlined above is that systematic heterogeneity of tastes is fully controlled by the variables chosen.

The exogenous variation of eligibility is exploited for example by Engen et al. (1994, p. 127-128). They use panel data to follow changes in savings for the same household before and after eligibility was expanded to all workers. The methodology they use is known as *difference-in-differences*. They separate the sample to a target group, consisting of people who were not eligible before but became eligible after the change, and a control group of people eligible throughout. The difference of saving after and before the eligibility expansion is calculated for both groups, and compared to each other. Engen et al. (1994) found that the average growth of saving was significantly higher for the control group thus they concluded that the extension of IRA eligibility was not the real force increasing household saving at that time. The crucial assumption underlying this methodology is that the taste difference between the two sample groups is constant as pointed out by Bernheim (2002). Interestingly, Feenberg and Skinner (1989) using the same dataset and method, with the only difference that they investigated assets and not the saving rate, came to the opposite conclusion. They found that IRAs had increased saving. They calculated the change in interest income between 1980 and 1984 for all families, then compared

the change for those who contributed to IRAs and those who did not (also controlling for income).

The effect of limit changes for IRA contributions is investigated by Engen et al. (1994, p. 128–133). They estimate the effect of changes in the IRA contribution-limit in a fixed effect setting, using panel data. Their dependent variable is, in contrast to the above studies, the yearly saving, i.e. the change in assets. Their OLS estimate of the IRA limit coefficient is insignificant, but the estimate from the median regression is positive. They conclude that for an average contributor each dollar contributed increases his or her gross saving by 0.31 dollar. Taking into account the tax revenue loss they find that only 4 % of IRA contributions increase national saving.

The 401(k) eligibility difference across employers is exploited in Poterba et al. (1995, p. 14–17). They compare different savings in different income groups for eligible and non-eligible households. They find that while the non-401(k) assets are almost equal for eligibles and non-eligibles, the total assets, including 401(k) savings, are higher for eligible households at any income. Thus they conclude that 401(k)s increase household saving.

We see from the above short summary of important empirical surveys that the conclusions regarding the usefulness of these plans are contradictory. As Engelhardt (1996) points out, these contradictory results are often calculated from the same data. One group of authors always gets to the conclusion that the tax incentives increase saving, whatever data and method they are using, while others always conclude the opposite. As Hubbard and Skinner (1996) suggest the truth is likely to lie between the two extremes: saving incentives increase saving but with a smaller amount than subsequently predicted by Poterba et al. (1995, 1996) and Venti and Wise (1996). Hubbard and Skinner believe that one dollar contributed to IRAs represent about 26 cents new saving, which is a compromise between 0 and 56 cents.

3.3. Saving incentives outside the United States

Although tax deferred saving plans are available in most developed countries there are relatively few empirical papers assessing the effectiveness of saving incentives in other countries than the United States.

One interesting example is Germany where saving remains relatively high even for old people, despite the high replacement rates⁴ in the public pension system. Whole life insurance, which is an asset with both an investment component and insurance component, constitutes a large part of household saving in Germany. Walliser and Winter (1998) conclude by analyzing data from the German Consumer Expenditure Survey (EVS) that the demand for whole life insurance is partly due to the tax exempt of this type of saving.

⁴The replacement rate for public pensions is about 70% in Germany.

Japelli and Pistaferri (2003) examine the effect of change in the tax treatment of life insurance contributions in Italy. They conclude that the change of tax incentives did not even have an effect on portfolio choice, which means that the incentive had no effect at all. They show that households to whom the after tax interest rate for life insurance investment increased did not save more in life insurance compared to households to whom the after tax interest rate decreased.

In the United Kingdom accumulated interest on special saving accounts is tax exempt. These savings do not need to be accumulated for retirement and are more liquid than incited savings in other countries since withdrawal is only penalized in the first 5 years of accumulation. Attanasio et al. (2004) analyze data on these accounts and find that only small part of the tax deferred savings represent new saving, i.e. there is a strong crowding out effect.

Similarly to the methodology of Engen et al. (1994, p. 127-128) and Feenberg and Skinner (1989), Engelhardt (1996) uses the cancellation of Home Ownership Saving Plan in Canada, which is an exogenous variation in eligibility. He concludes that the plan had substantial impact on national saving in Canada.

In Canada there is a pension saving program as well, called RRSP, with outstandingly high contribution limits compared to other countries and unrestricted availability. Sabelhaus (1997) examines the effect of RRSP savings on Canadian national saving. He argues that although aggregate figures would suggest that household saving is higher in Canada than in the US because RRSPs are better than IRAs or 401(k)s, more detailed analysis shows that the differences in the saving plans are not the main reason for the differences in savings.

In most countries there is some tax subsidy inciting household saving. It is impossible to judge them on theoretical grounds only. Empirical results provide a better understanding of their impact, but their results are contradictory. The bulk of the empirical studies discussing the effectiveness of saving incentives, i.e. the extent of crowding out effect, analyzes data from the US. Recently a few studies were carried out in some European countries (also with mixed results) but no empirical research has been done in Hungary.

The unresolved debate in the empirical literature shows that there was no real success in handling the endogeneity of tax deferred savings. The most promising methods may be those which use panel data and a historical change in eligibility.

4. Tax incentives in Hungary

Before presenting my empirical results on Hungarian household saving, it is necessary to review the Hungarian tax incentives on pension saving⁵. There are two subsidized forms of pension saving: voluntary supplementary pension funds and long term pension insurance. In this section I will summarize their features. I will also provide evidence on the low number of people contributing at the upper limit, suggesting that a large part of contributions may represent new saving.

Voluntary supplementary pension funds constitute a pillar of the Hungarian pension system. The benefits received from the fund after 3 years of accumulation and at retirement are tax exempt. Withdrawal before retirement but after more than 10 years membership or before 3 years membership but after retirement is possible, but in that case personal income tax has to be payed on the principal (but not on accumulated interest). Obviously, an important element of the incentive is that assets held in supplementary pension funds are illiquid. Before retirement or 10 years of membership money cannot be withdrawn at all from the account. As I explained in Section 2, illiquidity in itself can increase the level of savings.

Part of the contributions can be subtracted from personal income tax. When voluntary pension funds were introduced in 1994, the whole contribution was to be deducted from the taxable income. From 1995 50% of contributions could be deducted from the tax itself, which is a higher subsidy since income tax in the highest bracket was 44 percent in 1994. In 2000 the subsidy was decreased: since then only 30 percent of contributions is subtractable from income tax. This approximately means that both the interest and the principal are tax-free⁶. In the US, the benefit from joining a 401(k) plan arises only from tax-free accumulation of interest. In Hungary, however, interest income is usually not taxed so the incentive had to decrease the tax on the principal.

In Hungary the after-tax balance in period T per forint of pretax income in a conventional saving account is

$$B_1 = (1-t)(1+r)^T$$

where τ is the tax rate and r is the interest rate. The same balance in a voluntary supplementary pension fund is

$$B_2 = (1-t+0.3)(1+r)^T$$

The after-penalty balance in case of early withdrawal is

$$B_3 = (1-t+0.3)(1+r)^T - t$$

⁵There were other types of savings incited by tax allowances in Hungary: home ownership saving and stock investment. However, these incentives have been canceled.

⁶The progressive income tax is 18% in the low and 38% in the high bracket. The average tax is equal to 30% for people with 312500 forints monthly gross income.

B_3 is higher than B_1 for reasonable values of τ . If for example the average tax is equal to 30% then B_3 corresponds to a tax credit where the tax can be paid only at the time of withdrawal and thus the interest is accumulated on the untaxed principal. When a person who is only a few years before retirement enters a voluntary pension fund he will probably withdraw before 10 years of accumulation and thus get only the lower subsidy, corresponding to B_3 (instead of B_2), but in exchange his or her fund saving is more liquid.

The Hungarian system differs from most of the OECD countries (New Zealand is the other exemption) in that benefits from the private pensions are not subject to income tax. (Neither are the public pension benefits.) As noted earlier, when people make saving decisions they might consider gains in the far future with less weight because of hyperbolic discounting. So, deferring taxes when the benefits are received is less inciting than the same amount deferred at the time of contribution.

At the outset, in 1994, the limit subtraction from taxable income was 500,000 forints or 25% of the taxable income. The limit of subtraction was decreased in 1995 to 100,000 forints deductible from the income tax and increased in 1998 to 130,000 forints for those who reach retirement age before 2020. There was an indirect limit increase in 2000 when the subtractable percentage of contributions was changed from 50% to 30%. As a result, higher contribution corresponded to the limit subtraction: 333,333 instead of 200,000 forints for those who do not retire before 2020 and 433,333 instead of 260,000 for those who do.

As pointed out for example by Bernheim (2002) the upper limit of contributions should be chosen carefully, mainly because the marginal rate of return is not increased on savings for those who contribute at the limit. They instead perceive the tax incentive as a transfer, and do not change their behavior (according to the life cycle theory). In addition, limit contributors probably have other savings, thus the early withdrawal penalty does not deter them from decreasing their saving later. As a result, their contribution probably increases their total saving neither in the short run nor in the long run. The number of people contributing at the limit already suggests something about the possible extent of the crowding out effect.

In 2003, according to a representative sample from the Hungarian Tax Authority (APEH) only 3% of contributors contributed the maximum amount (100,000 or 130,000 forints). This share is extremely low compared to the 70% value in the US (Bernheim, 2002, p. 1213.). The limit contributions total up to 15.6 percent of all contributions. This suggests that 15.6% of the contributions would have been saved anyway. The other 84.4% can be partly new saving.

Figure 3: Number of limit contributors in the percentage of pension fund members and the share coming from limit contributors

% of limit

% of their saving

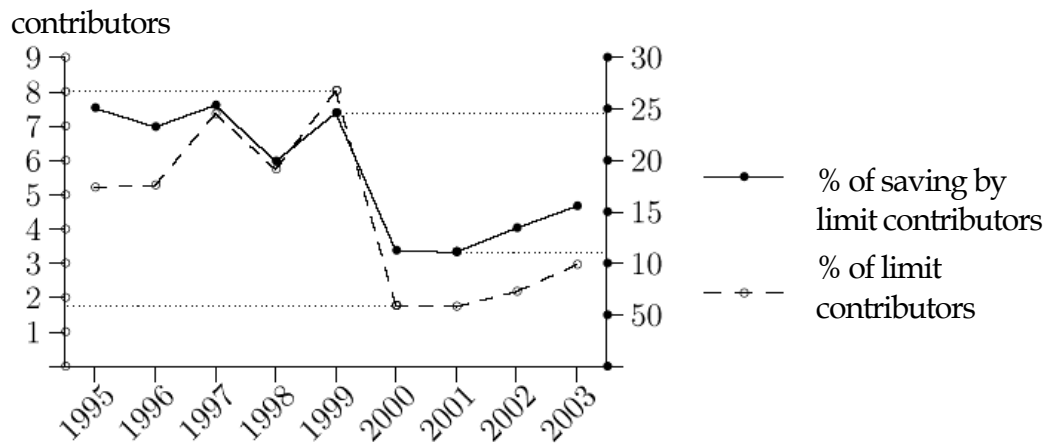
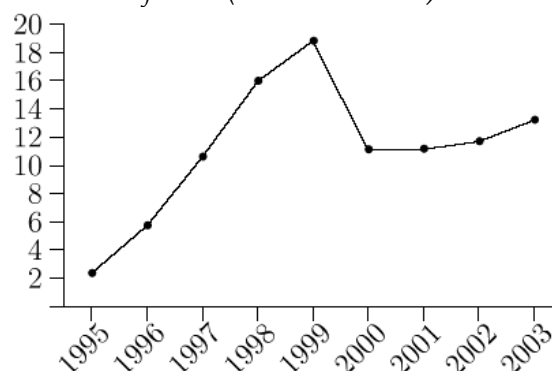


Figure 3 graphs how the number of limit contributors changed through time. Apparently a higher percentage of voluntary pension fund members contributed the maximum amount before 2000. The large drop in 2000 was due to the indirect limit increase, so the tax rule change made the tax incentive probably more effective in the sense that a larger part of contributions might represent real increase in savings since then.

Employers may match contributions up to a limit of the all-time minimum income. The matched contributions can be accounted as cost for the employer and are not included in the taxable income of the employee. After the tax rule change in 2000, employer contributions became more favorable than individual contributions (except for individuals in the lowest tax bracket). As a result, individual contributions dropped in 2000. The average individual contributions are shown in Figure 4. Since there was no parallel drop in the aggregate increase of voluntary pension fund wealth in 2000, it had to be offset by a similar increase in employer contributions.

Figure 4: Average yearly individual payments to voluntary supplementary pension funds (in thousand Ft)



In addition to the voluntary supplementary pension funds, pension insurance is subsidized as well if its maturity is at least 10 years. Twenty percent of payments but maximum 50,000 forints per year can be deducted from the

personal income tax. This allowance was also subject to changes.: until 1992 the limit was much lower, only 7200 forints, and there was one year, 1993, when this tax allowance was not available.

It would be useful to know the volume of aggregate savings in this form and the share coming from limit contributors, like for voluntary supplementary funds. Unfortunately, I had no access to data about pension insurances.

This section showed that tax incited voluntary pension saving increases the marginal return on saving for the majority of people because only a few of them are contributing at the limit. Thus it might increase savings if it does not crowd out non-deferred savings. The next section presents my empirical results suggesting that the crowding-out effect is probably not significant, and large part of the tax deferred saving represents new saving.

5. Evidence from the Hungarian Household Survey

Although important inferences can be drawn from the large body of research summarized in Section 3, I believe that analysis of data on saving of Hungarian households is important. Even if the previous literature had an equivocal answer to the question whether tax deferred saving crowds out other types saving, it is based on data from other countries, mostly from the United States. There might be significant differences in how US and Eastern European households respond to the tax incentives. Culture and history might play a significant role in determining the saving behavior of families, Hungarian households may react differently from US households and may have different taste for saving. As we have seen, the saving incentives introduced in Hungary are somewhat different from their US counterparts, IRAs and 401(k)s, even though they share many similar elements. In addition, the whole tax system differs across countries as well.

In this section I address the primary question of my work: Do tax deferred voluntary pension savings represent new saving or they crowd out other types of personal savings as households shift to the more advantageous forms of saving? I present evidence on the effects of saving incentives in Hungary based on data from the Household Monitor a survey conducted by Táarki (Hungarian Social Research Institute). The Household Monitor is a nationally representative household survey, completed yearly. The data base includes total savings of the households and monthly contributions to tax-deferred saving plans (supplementary voluntary pension funds and long term pension insurance). Unfortunately it does not include data about assets in these funds and insurances so the assets had to be estimated.

The Household Monitor data has some other drawbacks. First, as it is cross sectional data the conclusions drawn from it are less reliable than what could be extracted from a panel data set. Second, a more serious problem is that it only covers a part of household savings. Táarki compares the aggregate savings

of household sector and savings in Household Monitor data and gets to the conclusion that the survey covers only 27% of the actual savings (in 2001).

Unfortunately, there was no exploitable exogenous change in the tax rules during the time period the data cover. The change in 1998 in the upper limit for those who retire before 2020 would be a good exogenous variation for our purpose since although it depends on age the only systematic difference between those retiring in 2020 and those retiring in 2021 is probably the difference in the contribution limit. However, as the data do not cover all contributions to pension funds, there are too few people shown by the data to exploit this additional allowed contribution, i.e. the opportunity to contribute more than the limit being in effect for those who retire only after 2020.

I will use data of 1998, which is the first year when the survey included data about tax deferred saving and also the date of entering to a pension fund or signing a pension insurance contract, and of 2001, which is the last available year of the survey.

The financial saving of households needs to be analyzed when we are interested in the financing capacity of the household sector. However, when the concern is about households welfare we should rather focus on financial and nonfinancial assets together. In this section I will always consider the following 5 asset types:

A1 Assets accumulated in voluntary supplementary pension fund and in insurance (maturity of more than 10 years). I often refer to this category as tax deferred savings. Assets are estimated from the current monthly payments and the date when the respondent first contributed. There are some uncertainties causing the estimated values to be imprecise and possibly biased, too. First, monthly payments were probably not constant in most of the cases since the first time of contribution but we do not know how they have changed. Second, as there were huge differences in yields across funds it would be very difficult to incorporate the accumulated interest in the assets. Finally, using the self declared monthly contributions for estimating the assets is possibly downward biased because end-of-tax-year contributions are allowed as well in these funds and survey respondents might take only regular payments into account. I made the simplifying assumption that the rate of increase of contributions equals the yield rate, and estimated the accumulated assets as current monthly contribution multiplied by the number of months passed since the first time of contribution⁷.

A2 Other financial assets, as estimated by the respondents themselves to the question: *If you add up all the money, bank deposits, stocks, shares and foreign currency that you saved up, approximately how many HUF would it make?*

A3 Total financial assets, that is the sum of tax deferred and other financial assets.

⁷Average yield and change of average contribution could have been estimated and taken into account but I believe that this correction would not change the main implications drawn from the results.

A4 Net financial assets, computed as total financial assets minus liabilities. Liabilities are also the amounts reported by the respondents.

A5 Total assets, computed as net financial assets plus home equity. It may be more reasonable to use this category instead of net financial assets because liabilities include home mortgages as well. However, its drawback is that home equity only includes the value of the house or flat in which the family is living. Engen et al. (1994) also suggest focusing on total assets instead of financial assets. They criticize other authors to overestimate the effects of saving incentives partly because they only deal with financial assets. They argue that financial assets grew only because people shifted from housing to tax-favored financial saving in the form of owning less housing equity and also in the form of buying homes for higher proportion mortgage and lower down payment⁸.

Not looking at all of these asset types could be misleading. There might be a large shift between housing and financial assets because the relative return changes; or gross savings might increase while net savings decrease because financial markets are liberalizing and households can more easily take bank loans. By only looking at one type these effects could not be separated from the effect of saving incentives.

5.1. Cross-sectional analysis

Measuring the effect of voluntary pension fund membership and pension insurance on savings is difficult because the choice of entering a pension fund or buying pension insurance is not exogenous. Typically, those who take advantage of these saving incentives have originally a higher taste for saving than others.

To overcome this endogeneity problem, I used the difference-in-differences method suggested by Poterba et al. (1995). They divide the sample into four groups of families who are likely to have similar individual saving-characteristic. They use dummies as grouping variables indicating whether the family has savings on tax deferred accounts. Their first dummy stands for IRA saving, the second for 401(k) saving. They assume that within one group the average saving characteristic is constant through time thus the change in the mean savings can be compared across groups. They compare for example those with both tax deferred accounts and those with IRA but without 401(k), thus using the IRA dummy as a control variable when assessing the effect of 401(k)'s.

In Hungary the two types of tax deferred pension saving (voluntary supplementary pension fund and long term pension insurance) cannot be used similarly to establish four groups because there is almost no household in the

⁸This issue is less of a problem in Hungary because almost all families own their homes and because a higher down payment is usually needed for mortgages compared to the US. In addition, home equity is less liquid in Hungary.

sample possessing both types of account⁹. Thus I divided the sample into only two subsamples: families who contribute to tax deferred pension funds and families who do not. The first is treated as target group and the second as control group. I calculated the mean assets of both groups for all types of assets listed above (tax deferred saving, other financial saving, total financial saving, net financial saving, total saving including home asset) in two years, 1998 and 2001. I then compared the change of means between 1998 and 2001 for the target and the control group. As Poterba et al. (1995) suggest if savings of the target group increased less (or decreased more) than the savings of the control group, then tax deferred savings are likely to be financed from other types of savings. On the other hand, if all types of savings of the target group increased more (or decreased less) than the savings of the control group then the saving in tax deferred pension funds is likely to represent new saving.

Part of the variation in savings between the two observation years might be due to variation in household income and other family characteristics. In order to separate this effect, I controlled for income per person, education, and gender the following way. For the five types of assets and for both groups I estimated separately the regression

$$A_{it} = \alpha + \beta X_{it} + \gamma Year_{01} + \varepsilon_{it}$$

where X is the vector of controlled variables and $Year_{01}$ is a year dummy (0 in 1998, 1 in 2001) allowing different intersections for the two observation years. Note that β is assumed to be constant through time. I first included the age of the household head as a control variable, too, but its effect was insignificant for every type of asset at any reasonable level¹⁰. For the same reason I only included a college dummy for education. Then I estimated mean assets in both year at the 1998 mean values of the control variables:

$$\bar{A}_{1998} = \hat{\alpha} + \hat{\beta} \bar{X}_{1998}$$

$$\bar{A}_{2001} = \hat{\alpha} + \hat{\beta} \bar{X}_{1998} + \hat{\gamma}$$

The mean assets, controlled for income per person, gender and college degree of household head are presented in Table 1. Values in both year are CPI adjusted to 1995.

Table 1: Mean assets of households with and without tax deferred savings

	1998	2001	difference	diff-in-diffs
Tax deferred assets of households with tax deferred savings	43 141	77 102	33 962	

⁹In 1998 out of the 168 families in the sample who had some tax deferred pension saving only 6 had both types.

¹⁰That the age is insignificant in estimating savings contradicts the life cycle theory, which predicts that savings increase in the first part of the life-cycle and decrease after retirement. This puzzle will reappear in Section 5.2.2 where I examine savings of cohorts.

without tax deferred savings	0	0	0	33 962
Other financial assets of households				
with tax deferred savings	160 350	228 385	68 035	
without tax deferred savings	13 281	70 127	56 846	11 189
Total financial assets of households				
with tax deferred savings	83 414	185 062	101 648	
without tax deferred savings	13 281	70 127	56 846	44 802
Net financial assets of households with tax deferred savings	32 034	124 720	92 685	
without tax deferred savings	- 20 107	40 481	60588	32 097
Total assets of households				
with tax deferred savings	1 658 542	2 321 874	663 332	
without tax deferred savings	1 282 254	1 774 011	491 757	171 575

It is worth noting that the same difference-in differences estimates (shown in the last column of the table) could have been attained as the parameter g_1 estimated from the regression

$$A_{ti} = \alpha_0 + \gamma_0 Year_{01} + \alpha_1 D_{voluntary} + \gamma_1 Year_{01} D_{voluntary} + \beta_0 X_{ti} + \beta_1 D_{voluntary} X_{ti} + \varepsilon_{ti}$$

where $D_{voluntary}$ is a dummy variable standing for whether the household has tax deferred voluntary pension saving¹¹.

Table 1 shows that whatever type of saving is considered, savings of average households increased between 1998 and 2001. In addition, for every type of savings households with voluntary pension fund membership or long term pension insurance increased their savings more than households who did not take advantage of any of these tax incentives (all the values in the last column of Table 1 are positive). These results suggest that the policy targeted savings do not crowd out other types of savings. Instead, they represent new saving, families decrease their consumption to make use of the tax incentives. Indeed, the difference in net financial assets seems to be entirely due to the tax deferred pension savings.

The analysis of Poterba et al. (1995) I followed above was criticized by Engen et al. (1996). Their main critique is that Poterba et al. considered financial assets only, while households contributing to 401(k) plans might have

¹¹To see that the two methods yield the same difference-in-differences estimates we have to peg that for the target group $a=a_0+a_1$, $b=b_0+b_1$, and $g=g_0+g_1$; and for the control group $a=a_0$, $b=b_0$, and $g=g_0$. It follows that the mean assets for the two groups are $A^-_{1998} = \alpha^0 + \alpha^1 + \beta^0 X^-_{1998} + \beta^1 X^-_{1998}$, $A^-_{2001} = \alpha^0 + \alpha^1 + \beta^0 X^-_{1998} + \beta^1 X^-_{1998} + \gamma^0 + \gamma^1$ and $A^-_{1998} = \alpha^0 + \beta^0 X^-_{1998}$, $A^-_{2001} = \alpha^0 + \beta^0 X^-_{1998} + \gamma^0$, respectively. The differences are $\gamma^0 + \gamma^1$ and γ^0 , thus the difference-in-differences estimate is equal to γ^1 .

reallocated wealth from nonfinancial to financial assets. Indeed, Engen et al. show that US households with 401(k) did not accumulate more wealth when housing equity was included. We see from the results in Table 1 that in Hungary the conclusion from total assets including home equity is the same as with financial assets only. Thus the above critique is not valid here. However, it is possible that voluntary pension fund members redistributed wealth from housing assets to financial assets and still their home assets increased more than for the control group. The target group had more home assets in 1998 than the control group and since real home prices approximately doubled during the period their home asset would have increased more by default.

Although as Table 1 shows the difference-in differences estimator is positive for all types of assets, it is not necessarily correct to conclude that it is because tax incentives increased saving. The similar result of Poterba et al. (1995) are more persuasive because savings there did not increase for households with tax deferred accounts but increased for households without it. Here in contrary, both increased, and the fact that the savings of the target group increased more might simply sign that there is a systematic difference between the two groups in the increase of savings as well. This problem would not disappear even if we had panel data and could use a fixed effect model to control for individual differences. However, if saving rates were also available to use instead of assets then a panel analysis similar to the one conducted by Engen et al. (1994) would perhaps lead to more reliable conclusions. Next, instead, I use a different approach called cohort analysis to answer the same question: whether tax incited saving crowds out other personal saving.

5.2. Comparison of cohorts

5.2.1. *Two cohorts before retirement*

Following Poterba et al. (1996) I compared the assets of two cohorts just before retirement. The idea underlying the methodology is that we can assume that the two cohorts have the same characteristics except from the difference in the length of time they were exposed to saving incentives. People born in the same year form one cohort¹². We will observe two cohorts reaching the same age, 54 years, in different years. Both observed cohorts fully represent the before-pension population at their time, so they are likely to have the same unobservable human characteristics on average. However, the younger cohort had a longer time to accumulate tax reduced accounts because they were younger at the time when the allowance was introduced. If their savings turn out to be higher it is probably due to the longer exposure to the incited saving

¹²In practice I formed one cohort from people born in 3 (this section) or 5 (next section) subsequent years to increase sample size.

possibilities. This way of dealing with heterogeneity makes it possible to assume that the length of contribution to pension funds is exogenous.

Venti and Wise (1996) analyzed assets of households just *before* and *after* retirement. Since I estimated the tax deferred savings from monthly contributions, and households after retirement typically do not have any payments to the pension fund or insurance company, I could only investigate families *before* retirement.

Tax rules aiming to stimulate pension fund membership were first introduced in 1994. I compare the savings of two cohorts at the age of 54¹³. The older cohort reached this age in 1998, the younger in 2001. Thus the first group had 4 years to accumulate on the tax deferred account while the second group had 7 years. I again control for income the same way as in the previous section but dismiss the less important control variables because the sample size is too small¹⁴ and the degree of freedom would have been too low otherwise. The mean savings of the two cohorts at age 54 are listed in Table 2.

Table 2: Mean savings at age 54 of cohorts born in 1944 and 1947 (forint)

	old cohort	young cohort
A1 Pension funds and insurance assets	17,778	18,247
A2 Other financial assets	101,050	122,841
A3 Total financial assets	122,679	151,616
A4 Net financial assets	81,307	72,343
A5 Total assets	2,928,801	6,959,854

The tax deferred savings are only slightly larger for the younger cohort (reaching age 54 in 2001). We should remember that pension fund assets were estimated from the entry year and from the monthly contributions. Thus if the monthly contributions were constant through time then the estimated assets of the young cohort would be about 7/4 time of the estimated assets of the old cohort. If the estimated assets of the younger cohort are less than 7/4 times of the assets of the older cohort then the average amount of monthly contributions had to decrease after 1998 thus the estimation of the assets of the younger cohort is downward biased.

To see whether there is a crowding out effect we are interested in the other asset types, A2–A5. Most of the other asset types are also larger for the younger cohort suggesting that tax incentives generate new saving and do not crowd out other saving. However, mean net financial assets (A4) are smaller for the younger cohort, which can sign that the increased asset holding is financed from debt, not from decreasing consumption.

A large share of the population had neither bank account nor debt or saving (30–40% of families). These mostly low income households had never had any connection to financial institutions. When we are interested in the

¹³The age of the household is defined as that of the household head.

¹⁴In one cohort there are only about 20 households with tax deferred savings

changes of savings it is reasonable to restrict the analysis on “financially relevant” households who have positive financial saving or debt, as suggested by Tóth and Árvai (2001)¹⁵. As Table 3 shows, after leaving out non-relevant households from the sample all asset types are higher for the younger cohort (even net financial assets). This suggests that tax deferred saving does not crowd out other saving but represents new saving.

Table 3: Mean savings of relevant households at age 54 (forint)

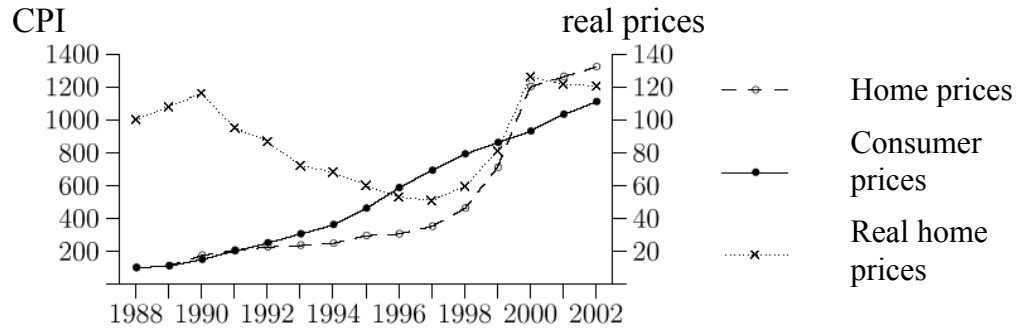
	old cohort	young cohort
A1 Pension funds and insurance assets	38,270	47,832
A2 Other financial assets	189,220	286,894
A3 Total financial assets	229,089	341,240
A4 Net financial assets	148,848	192,432
A5 Total assets	3,283,986	7,315,007

The most striking fact appearing from both Table 2 and Table 3 is the low level of saving in families just a few years before retirement. According to the life-cycle model the observed age would be the age when individuals possess the highest assets but in fact the average financial saving of the families is only about one-third of the average yearly income.

Housing assets are much higher than financial assets probably because most families in Hungary live in their own flat for historical reasons. In addition, real estate investment has a high prestige among households since people consider it to be a less risky long term investment than securities. Thus they prefer to invest in real estate than in other instruments.

¹⁵The same restriction is used by Engen et al. (1994).

Figure 5: House prices



Although both Table 2 and Table 3 confirm the result from the previous section, i.e. that the incentives increase household saving, the average financial asset holding of families before retirement is still extremely low and increase only slowly. A significant increase between 1998 and 2001 can only be observed if we take into account home equity but this increase can mainly be attributed to the high increase in real house prices between 1998 and 2001 (see Figure 5).

5.2.2. Following cohorts in time

When the data consist of independent representative samples in different points of time, following families through time like in panel data is not possible. Instead, as suggested by Venti and Wise (1996), I define a whole series of cohorts, calculate the mean assets within all cohorts¹⁶ and follow the means through time. Then it is possible to compare the assets of the same cohort in different years, the assets of different cohorts at the same age, or the assets of different cohorts in the same year.

I will refer to a cohort with the age it reached in 1995. C30, for instance, denotes those who were 30 years old in 1995. I calculated the mean assets of 7 cohorts (C27, C32, C37, C42, C47, C52 and C57) for the 5 asset types in three years, 1995, in 1998, and in 2001.

¹⁶It is suggested by many authors to use median instead of means as a measure because it is more robust: it is e.g. less sensitive to high positive outliers. However, in Hungary less than half of the families have positive assets and medians would be all zero (except for the last type, A5) thus it would not be informative.

Figure 6: Saving of cohorts (thousand Ft in (a)-(d), million Ft in (e))

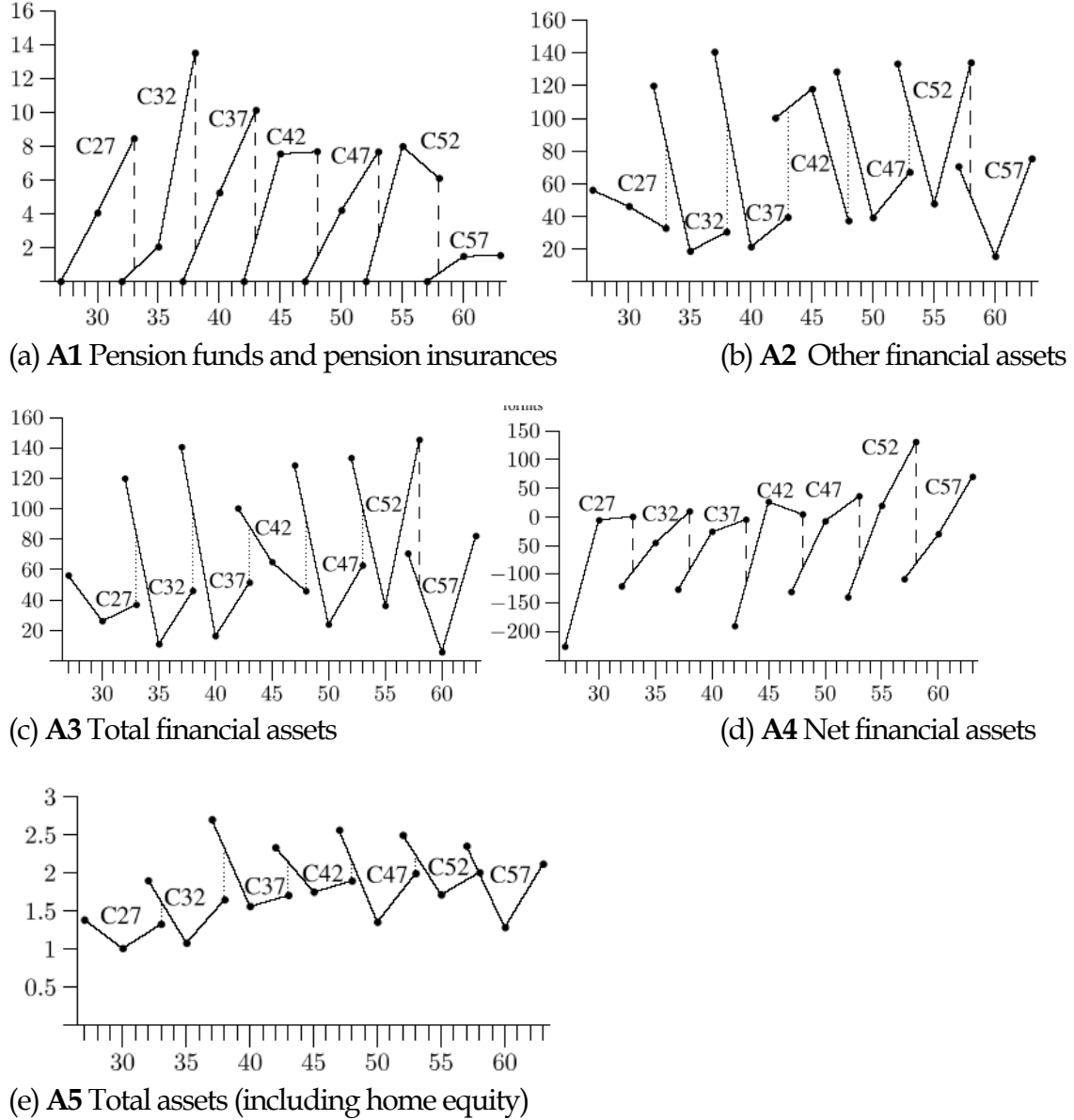


Figure 6(a) shows the results for type A1, the tax favored pension savings. Any three connected points show the pension asset of one particular cohort in the three years of observation. These lines should be increasing for all cohorts because only contributions were taken into account for the estimation of the assets and not the withdrawals. Yet, the path bounds back for the C52 cohort and almost for the C57 cohort as well. The reason is that the assets of the older people are imprecisely estimated. In particular, they are underestimated, because a large part of these cohorts was already retired, and since retired people did not contribute to pension funds anymore their assets are estimated to be zero even though they might be positive.

The prevailing pattern from Figures 6(b) and 6(c) is that in most cohorts the level of both other and total financial saving dropped between 1995 and 1998, then increased between 1998 and 2001 but reached the 1995 level only in the older cohorts, C52 and C57. The decrease of savings after 1995 is at least partly due to the sharp decrease of real wages in 1995 and 1996. Although real wages already increased in 1997, they reached their 1994 level only in 2001¹⁷. It is possible that the 1995-96 shock is the reason for the saving level in 1998 being still much below the 1995 level. The extent to which the drop in total financial saving is to be interpreted as evidence against the beneficial effect of tax favored saving program is uncertain. The promising catch up by 2001 supports what we found in the previous sections: in the long run, voluntary supplementary fund saving does not substitute other financial savings but constitutes new stocks (even though only a small stock) of saving which would not exist without the tax incentives.

Total net savings (A4) showed on Figure 6(d) increased in every cohort since tax incentives have been introduced, and a small fraction of this increase is coming from voluntary pension fund savings.

Including housing, the assets are much higher again. One possible explanation was provided in the previous section. Mean values of housing assets move approximately in line with the real housing prices in this period, (see Figure 5).

Usual cross sectional comparison of different cohorts in the same year could be done by looking e.g. at the third point of each line. The life-cycle hypothesis predicts that until retirement savings increase. Accordingly, if the motivation for saving is the one explained by the life-cycle theory, these points should show an increasing pattern¹⁸. This pattern does not emerge from my results on A1 assets showed on Figure 6. Comparing the paths we see that the middle aged families (C32 and C37) accumulated the most, and families just before retirement have much lower savings than younger families. The reason might be again that the older a cohort is, the higher the share of those who are already retired, and thus the more the estimated A1 assets are biased downward.

Looking at other types of savings, A3–A5, the contradiction to the life-cycle model seems to disappear but still no strong support can be observed. Public pensions were not included in the assets although they are in fact mandated savings. I believe that if the present value of receipts from the social security system were taken into account as an asset, the wealth of families would increase until retirement and decrease after, in line with the life-cycle model.

Along vertical dashed lines we can compare the assets of different cohorts at the same age. This vertical difference corresponds to the actual effect

¹⁷Source: HCSO (KSH)

¹⁸The last point corresponding to age 63 may already be lower because a large share of 63 years old are already retired.

of the tax policy on voluntary pension fund savings. For example, until the age of 33 the C27 cohort accumulated in voluntary pension funds about seven thousand forints more than the C32 cohort (Figure 6(a)), but about fifty thousand forints less in other forms (Figure 6(b)).

Obviously, for A1 assets, the younger cohorts' savings always exceed the elders' at the same age as they had had already more years since the start of the pension funds when they reached the same age. If their savings in other types are lower then tax deferred savings probably crowd out other savings. In contrast, if other savings are higher as well, then it suggests that the A1 assets represent new savings. Looking at Figure 6, only A4 assets confirm the results of the previous sections: namely that tax deferred saving increases household saving. Even in case of A4 assets, for instance at age 33 the C27 cohort had about one hundred thousand forints higher net financial savings than the C32 cohort, while only about seven thousand forints more voluntary pension savings. The whole increase in the net financial assets cannot be due to the tax incentives on pension saving, and this makes the conclusions about new savings less plausible.

6. Conclusion

Household saving was low in the last decade in Hungary, similarly to most European countries, the United States and Canada. Low household saving gives rise to concerns about the drop in living standard after retirement. In addition, household saving is the most important component of national saving, thus if it is low then economic growth can slow down.

I analyzed the effect of saving incentives on household saving and national saving, focusing on the tax incentives on voluntary pension savings. In Hungary voluntary supplementary pension fund contributions and long term pension insurance savings are tax exempt. Although aggregate figures show that savings in these forms are relatively low in Hungary compared to similar programs in other countries, they are steadily increasing. The latter suggests that tax deferred saving will form an important fraction of household saving within a few years.

Since the aim of these saving incentives is in part to increase national saving, it is important to know whether their increase is only due to redistribution from other types of saving or to reduced consumption. In order to find out this I investigated Hungarian household data. Using the difference in differences methodology, I found supporting evidence for the view that tax deferred savings do not crowd out other types of saving thus they increase national saving. However, a cohort analysis on the same data provided mixed results.

The scope of these results is limited because, as earlier empirical research in other countries showed, conclusions are very sensitive to the methodology

used. Both methodologies I applied are based on assumptions which are not necessarily true. More reliable conclusions could be drawn from panel data, such as tax authority data, exploiting the variation in the limit of contributions for those who retire before 2020.

Nevertheless, there seems to be more evidence favoring the new-saving view. On the whole, my empirical results suggest that the crowding out effect is not strong thus the tax incentives in Hungary are effective.

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